Standard of Care in Periodontology

The discipline of Periodontology deals with the development, anatomy, structure, and function of the various soft and hard tissues of the periodontium in health and disease, i.e., gingiva, periodontal ligament, root cementum, and alveolar bone proper. It concerns diagnosis, prevention, and treatment of the various diseases and conditions affecting the periodontal tissues. There are close relationships to Oral Microbiology and Immunology, and Community Medicine. The impact of periodontal disease on non-oral diseases has to be considered as well. There are also close relationships to esthetic dentistry as well as implant dentistry. Practical issues of Periodontology include treatment modalities for the different diseases and conditions of the periodontium, techniques, and instrumentation. Treatment of the periodontally diseased patient should be considered within the framework of Comprehensive Dental Care.

SOME DEFINITIONS

- **Bleeding on probing** (to the bottom of the sulcus or periodontal pocket) will be recorded as present or absent.
- **Clinical attachment level** is the distance between the cemento-enamel junction and the clinically determined bottom of a gingival sulcus or periodontal pocket. It is measured with calibrated probes to the nearest mm.
- **Dental plaque** is to be recorded as present (at the gingival margin) or absent.
- **Furcation involvement** in multirooted teeth is regarded as horizontal attachment loss. It may be classified as *Degree 1*: up to 3 mm horizontal attachment loss; *Degree 2*: more than 3 mm horizontal attachment loss but not encompassing the whole furcation; and *Degree 3*, a through-and-through involvement. Any furcation involvement is to be assessed with a special, curved, color-coded periodontal probe (Nabers probe).
- **Gingival recession** is the distance between the cemento-enamel junction and the gingival margin.

- **Infrabony lesion.** Any periodontal lesion where the bottom of the periodontal pocket is located apical to the alveolar crest. It might be seen on radiographs where it is sometimes called vertical bone loss or angular bony lesion. Infrabony lesions may be characterized by the number and location of bony walls left.

- **Initial phase of periodontal therapy** is the first phase of treatment in a patient with periodontitis. It is considered the hygienic phase when oral hygiene has to be considerably improved and soft and hard bacterial deposits (plaque, calculus, stain) are removed from the tooth surface by scaling and polishing. It is also called non-surgical periodontal therapy.

- **Oral prophylaxis** consists of patient motivation and instruction for proper oral hygiene, scaling and polishing of tooth surfaces and topical fluoride application. It is the usual treatment for plaque-induced gingivitis.

- **Periodontal probing depth** is the distance between the gingival margin and the clinically determined bottom of a gingival sulcus or periodontal pocket. It is measured with calibrated probes to the nearest mm.

- **Probing pressure.** Both probing depth and bleeding on probing considerably depend on probing pressure. Ideally, probing pressure of 1.5 MPa should be applied, which relates to 0.2-0.25 N probing force and a probe with a tip diameter of about 0.45 mm.

- **Supportive periodontal therapy** is the third phase of periodontal treatment and is organized after initial periodontal therapy and, if needed, surgical interventions have been completed. Its aim is maintaining the periodontal condition over time. Continuous risk assessment is the basis for determining appropriate intervals for follow-up visits, or recall sessions.

- **Surgical phase of periodontal therapy** is the term used to describe the second phase of periodontal therapy whenever surgical corrections are needed.
Tooth mobility is classified as Degree 1: recognizably increased mobility, crown may be tilted up to 1 mm; Degree 2: more than 1 mm tilting of the crown; Degree 3: significant increase of tooth mobility with displacement in a vertical direction as well. Note that physiological mobility of any tooth largely depends on length and shape of the entire root complex.

CLASSIFICATION OF PERIODONTAL DISEASE AND A PERIODONTAL SCREENING SYSTEM

Classification of Periodontal Diseases and Conditions had been thoroughly revised in 1999 on the occasion of an International Workshop organized by the American Academy of Periodontology (AAP). This classification system is currently used worldwide. In principle, it differentiates gingival diseases from chronic and aggressive periodontitis, and periodontitis as manifestation of systemic disease. In addition, necrotizing gingival and periodontal diseases are defined. For the special purposes of screening and assigning patients to undergraduate students at different levels of education, an abbreviated periodontal screening system may be used. Thus, according to extent and severity of the disease patients with plaque-related, chronic periodontal diseases may be assigned to the following categories which should largely conform to the most recent Periodontal Disease Surveillance system of the AAP/CDC.

- **Advanced/severe periodontitis.** Two or more non-adjacent teeth with interproximal sites showing clinical attachment loss of 6 mm or more and pockets of 5 mm or more. Cases with furcation involvement, infrabony lesions and/or loss of alveolar bone of more than 1/3 of the root length are usually classified as advanced periodontitis. Clinically, deep periodontal

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pockets may be associated with recession and increased tooth mobility.

- Localized advanced periodontitis: less than 30% of teeth affected.
- Generalized advanced periodontitis: 30% or more teeth affected.

- **Moderate periodontitis.** Two or more non-adjacent teeth with interproximal sites showing clinical attachment loss of 4 mm or more or pockets of 5 mm or more.
  Radiographs show usually loss of alveolar bone up to one third of the root length while clinically periodontal pockets and loss of clinical attachment of up to 6 mm may be found.
  - Localized moderate periodontitis: less than 30% of teeth affected.
  - Generalized moderate periodontitis: 30% or more teeth affected.

- **Mild periodontitis.** Two or more interproximal sites showing clinical attachment loss of 3 mm or more and two or more interproximal sites with periodontal pockets of 4 mm or more (not on the same tooth) or one site with a periodontal pocket of 5 mm or more.\(^3\) On intraoral radiographs beginning alveolar bone loss in particular involving the loss of lamina dura is visible.

- **Gingivitis.** There is no or very little loss of clinical attachment (in case of recession). Probing depths are usually in the range of 1 to 3 mm. However, deeper probing depths (without loss of clinical attachment) may be found in certain areas of the dentition and in subjects with a ‘thick’ periodontal phenotype. Bleeding on probing may be found in certain areas of the

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dentition (localized) or is widespread (generalized). Based on color and swelling of gingiva, gingival inflammation may be classified as mild, moderate, or severe. Special patient categories, such as aggressive periodontitis, necrotizing periodontal disease and mucogingival problems and disorders, are usually only taught didactically to undergraduates. In certain cases patients with these diagnoses are assigned to students and treatment should be conducted in close collaboration with the mentor.

HISTORY

Medical History of a patient with periodontitis may have a focus on important information regarding behavioral and acquired risk factors of the disease such as smoking and diabetes mellitus, as well as disorders which might interfere with the treatment of periodontitis such as cardiovascular disease and highly increased risks for infective endocarditis. Since periodontal probing will lead, in the majority of patients, to gingival bleeding with the consequence of transient bacteremia, in the highest risk group for infective endocarditis antibiotic prophylaxis is indicated before any comprehensive dental examination. Dental History self-evidently includes patient’s chief complaint and previous periodontal treatments.

EXAMINATIONS

Methodical extra- and intra-oral examinations have to be completed before any discipline-related examination commences.

Clinical Periodontal Examination

The student should follow a systematic pattern in all examinations. Except for periodontal probing depth, only positive findings are recorded. If possible, the following sites should be examined: mesiobuccal, midbuccal, distobuccal, distolingual, midlingual, mesiolingual. It is advisable to examine/measure the

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buccal/facial surfaces of the upper jaw first, beginning distobuccal, midbuccal, and mesiobuccal to tooth #18, and ending distobuccal to #28; then continuing with palatal measurements from distopalatal to #28 up to distopalatal to #18. Examinations are continued at buccal/facial sites of ##38 up to 48, and finally lingual surfaces between ##48 and 38.

*Quadrant-wise periodontal probing*

A color-coded straight probe is used (Hu-Friedy CP18). The probe should be inserted into the gingival sulcus or periodontal pocket parallel to the tooth axis. At interproximal sites the probe is inserted in contact with the contact point. An oblique insertion of the probe may facilitate the detection of a deep infrabony lesion and may be conducted if respective radiographic evidence can be found, which is then to be confirmed clinically. After having probed each quadrant any bleeding on probing is checked and recorded by underlining the respective probing depth in the chart. Clinical attachment loss is recorded whenever the cemento-enamel junction is visible or can be traced with the probe within the pocket.

*Furcation involvement*

In cases of moderate or advanced periodontitis the furcation areas of maxillary and mandibular molars and maxillary premolars are probed with a curved Nabers probe (LM 20B-21B). It is important to consider the respective furcation entrances. For example, distal furcations in maxillary molars are probed from a distopalatal aspect, while furcations of premolars are probed both from mesio/distobuccal and mesio/distopalatal aspects. A *Degree 1* involvement means horizontal attachment loss of not more than 3 mm; a *Degree 2* involvement means more than 3 mm loss of horizontal attachment; and *Degree 3* a through-and through involvement.
**Tooth mobility**

It may be assessed by trying to tilt the crown of a tooth with the handles of two dental instruments. Increased tooth mobility is recorded as *Degree 1*, meaning up to 1 mm crown tilting beyond physiological mobility; *Degree 2*, i.e. more than 1 mm; and *Degree 3*, i.e. mobile in an even vertical direction.

**Oral hygiene**

Presence of plaque may be recorded on mesial, buccal, distal, and lingual surfaces of each tooth and charted in a special form. Plaque has to be disclosed with a suitable disclosing solution, for example GC Tri Plaque ID Gel, which is directly painted on the teeth with large cotton pellets after rinsing off sticky saliva. The percentage of surfaces covered by plaque is immediately calculated and the patient has to be informed about it. Oral hygiene has to be assessed in each session of the Initial Phase of periodontal therapy, at any reevaluation and during any recall visit.

**Radiographic examination**

In general, radiographs should supplement the clinical examination. The periodontal condition is assessed by considering the overall level of the alveolar bone, the relation between root length and bone level, the presence of infrabony lesions, the presence of furcation involvement, the width of the periodontal ligament, the presence and appearance of a *lamina dura*, etc. An orthopantomogram can provide only an overview and does not allow definite conclusions about extent and severity of periodontal disease. However, it provides valuable information about any abnormal/pathological processes in the jaws, the surrounding tissues, and the neighboring areas of the oral cavity as well as caries and present restorations. An orthopantomogram is usually sufficient in cases of mild periodontitis. In cases of moderate or advanced periodontitis and for comprehensive dental treatment planning, a full-mouth survey consisting of intraoral radiographs is indispensable.
Further examinations
In severe cases of non-responsive chronic periodontitis and most cases of aggressive periodontitis, adjunctive antimicrobial therapy may be indicated. Microbiological examinations of plaque samples may be indicated before prescribing systemic antibiotics. It should be taken into account, however, that the potential of gaining valuable information for decision making is regarded low while additional costs are quite high. Any microbiological examination should be scheduled in collaboration with the responsible mentor.
Genetic tests in order to examine the susceptibility for more severe forms of periodontitis, in particular concerning polymorphisms in the interleukin-1 gene cluster, have been commercially distributed for some years. Again, gain of further information for decision making is limited\(^5\) and costs and other potential adverse effects are considerable.

TREATMENT PLANNING
Sequence of treatment
Oral prophylaxis and periodontal treatment are integral parts of the comprehensive treatment plan. Priority must be given to treatment of acute or painful conditions and to the patient’s chief complaint. However, although the chief complaint should be in focus of the treatment planning, it must be sequenced according to a professional overall treatment plan. Elimination of painful conditions, extraction of teeth that cannot be treated, excavation of acute caries and placement of temporary fillings and, if needed provision of temporary dentures and crowns must be given priority before the ‘regular’ treatment starts.
In patients with mild/moderate or advanced periodontitis, periodontal treatment including establishing an acceptable level of oral hygiene is usually the first step in the comprehensive treatment plan. Definitive restorative treatments should be performed after completion of periodontal treatment.

Oral prophylaxis

Oral prophylaxis is provided to any patient with gingivitis, i.e. plaque-induced inflammation of the tissues without any loss of periodontal attachment. It comprises the following steps:

- **Motivation.** Oral hygiene improvement can only be expected if and when a patient with poor oral hygiene understands the importance of plaque in the initiation and development of oral disease. Communicating various levels of oral hygiene to the patient is another cornerstone of patient motivation. Therefore, the patient’s oral hygiene status is assessed in each session after disclosing, and the percentage of plaque-covered tooth surface calculated.

- **Instruction in proper oral hygiene.** Frequencies and patient’s own techniques of tooth brushing are revised. Hand brush or electric toothbrushes may be recommended, depending on the preference of the patient. Systematic tooth brushing should be explained. Interdental tooth cleaning should be introduced only after removal of any calculus and/or restoration overhangs.

- **Supragingival scaling** with hand and/or ultrasonic instruments. Air/powder-abrasive systems (ProphyJet) may be used as well. Note that subgingival scaling in shallow sites inevitably leads to undesired attachment loss.

- **Polishing** of tooth surfaces with polishing paste of decreasing abrasiveness (depending on the amount of stain).

- **Topical fluoridation** with suitable fluoride solution/gel.

The 1-hour session has to be repeated on a weekly basis until oral hygiene has improved to a satisfactory level. This might depend on the ability and willingness of the patient as well as the assumed risk for the development of destructive periodontal disease.

**Initial phase of periodontal therapy**

A basic feature of periodontitis is loss of periodontal attachment. Thus, root surfaces are pathologically exposed and covered by soft and hard bacterial
deposits. Supra- and subgingival scaling and root planing are therefore integral parts of tooth debridement.

- **Motivation.** The patient’s oral hygiene status is assessed in each session after disclosing, and the percentage of plaque-covered tooth surface calculated.

- **Instruction in proper oral hygiene.** Hand brush or electric toothbrushes may be recommended, depending on the preference of the patient. Systematic tooth brushing should be explained. In particular, interdental tooth cleaning should be introduced only after removal of any calculus and/or restoration overhangs.

- **Supra- and subgingival scaling and root planing** with hand and ultrasonic instruments. Air/powder-abrasive systems (ProphyJet) may be used as well. Subgingival scaling should be performed under local anesthesia.

- **Polishing** of tooth surfaces with polishing paste of decreasing abrasiveness (depending on the amount of stain).

- **Topical fluoridation** of a suitable fluoride solution/gel. Depending on the severity of the case, scaling and root planing may be done in one session or may require a quadrant- or even sextant-wise advancement in 1-hour weekly sessions. Each session should start with oral hygiene assessment, and, if necessary, re-motivation and re-instructions. See the possibility of single-stage full-mouth disinfection below.

In order to schedule the hygienic phase in a reasonable way, the patient should be provided with all necessary weekly appointment dates in the first session.

**Re-evaluation after initial periodontal treatment**

Upon completion of the initial phase of periodontal therapy the treatment result obtained has to be evaluated. This is done by a complete periodontal re-examination of the patient. Based on the re-evaluation it will be decided whether and to what extent periodontal surgery is needed.
Surgical phase of periodontal therapy

While non-surgical re-treatment of most sites with persistent pockets of, say, 4 to 6 mm should be considered first, surgical corrections are usually needed in the case of infrabony lesions and furcation involvements where access to the infected root surface is hampered. While planning surgical periodontal therapy the following has to be considered:

- Which teeth/areas need surgery?
- What kind of surgical operation is needed?
- In what sequence should the surgical operations be performed?
- Special precautions that need to be taken, for example prophylactic antibiotics, sedatives, etc.
- Who will perform the surgery – the student or the instructor/professor?
- Where will the surgery be performed – in the student clinic, the staff clinic, or operation theatre?
- When – within the comprehensive treatment setting – will the surgery be performed?

In most cases, the instructor will perform the surgical procedures while the student will assist him/her. Here, the full scope of periodontal surgery including regenerative surgery and surgical root coverage procedures should be demonstrated. Surgical therapy performed by students has to be restricted to cases and tasks that (s)he is expected to learn and master during the 5 semesters of the clinical curriculum. Students will be trained and, after having assisted in several operations, allowed to perform simple access flaps at a maximum of 2 to 3 teeth in easily accessible areas. If indicated, in rare cases also gingivectomy may be performed. Surgical crown lengthening should be done whenever the biological width may be violated by restorative measures, i.e. if and when the preparation line is close (about 2mm) to the bone level.

Supportive periodontal therapy

Supportive periodontal therapy has to be planned on an individual basis for each patient. This has to be done after re-evaluation of the periodontal situation about
6-8 weeks after wound healing has been accomplished. A thorough risk assessment has to be done considering:

- **Patient level risks**, such as systemic disease, genetics, behavioral risk factors, such as smoking;
- **Dentition level risks**, such as lost teeth due to periodontal disease, the alveolar bone level as related to age, fixed or removable dentures, amount of bleeding after probing, persistent infection\(^6\) with, for example *Aggregatibacter actinomycetemcomitans* and/or *Porphyromonas gingivalis*;
- **Tooth and site level risks**, such as increased probing depths, open furcations, frequent bleeding after probing, local presence of pathogens.

Specific functional risk diagrams are most suitability for both patient motivation and risk assessment and can be accessed online (see below). A 1-hour recall session consists of

- Detailed history in particular with regards to established risk factors for periodontitis and possibilities for controlling them;
- Thorough periodontal examination including assessment of oral hygiene,
- Re-motivation and re-instruction, if necessary;
- Supragingival scaling and polishing; subgingival scaling under local anesthesia in areas with persistent pockets (5 mm or more) which have bled upon probing;
- Topical application of suitable fluoride solution/gel.

The suggested recall interval will mainly depend on the overall risk, meaning that patients with a low risk for periodontal destruction will be followed-up after 1 year, while patients with moderate and high risks will be seen after 4-6, or even 3 months, respectively.

\(^6\) Note that a microbiological examination in a patient with chronic periodontitis is only done in case of persistent pockets despite proper non-surgical/surgical treatment had been performed
TREATMENT GUIDELINES

The patient
Patients will be treated according to a comprehensive format and all treatments rendered to a patient will be scheduled accordingly. Patients will be distributed to students according to their level of competence (see previous paragraphs). Patients presenting with severe periodontitis and more complicated problems (for example need for large fixed dental prosthesis) may have to be shared between junior and senior students as treatment continues for several semesters.
A patient must always be treated with respect and dignity. However, patients behaving inappropriately or failing to show up for appointments will be cautioned and may eventually be dismissed from the clinic.
For general guidelines about patient treatment, the student is referred to the Clinical Policy Manual.

The workplace
All areas within the student cubicle must be kept absolutely clean and tidy during as well as between patient sessions. Upon completion of a patient treatment session, it is the duty of the student to remove all instruments and disposable material from the cubicle and prepare the workplace for the next patient. See the respective guidelines for infection control in dentistry for more detailed information about the clinical workplace requirements.

Instruments and cubicle laying
All instruments needed for patient treatment will be available at the clinic dispensary. Occasionally, the student may have to pick up instruments/materials from the main dispensary. The non-surgical and surgical periodontal hand instruments are available in two different cassettes, respectively, and the contents of the cassettes are described in a handout. In addition, there are a number of supplementary periodontal instruments available at the clinic dispensary (see handout). Supplementary instruments are meant to be used following recommendations and advice from the clinical instructor/mentor. Before
asking the patient in, periodontal instruments have to be checked for sharpness and, if necessary, sharpened. See the respective handout for maintaining periodontal instruments.

Laying of the student cubicle in preparation for a patient session should be described in detail in respective guidelines for infection control. These are general guidelines that must be followed for patients during examination and all non-surgical therapy. Whenever surgical treatment is planned – including periodontal surgery or extractions – the laying of the cubicle will be somewhat modified. The surgical laying of the cubicle and the special requirements regarding attires will be described in a handout.

The patient record
There will be a computerized administrative and clinical record system in the Dental Clinic. The Periodontology part of the system will be customized for that purpose. Students will be trained how to use the computerized record system.

The treatment plan
The student is expected to follow the comprehensive treatment plan approved by the instructor during all treatment of a patient. The treatment plan can only be changed following approval by the instructor, and all changes must be registered in the appropriate section of the patient’s record.

The initial phase of therapy
Pretreatment medication
In due time before scheduling a patient for treatment, the treatment plan has to be checked to see whether the patient will needs any medication, in particular antibiotic prophylaxis. In case of the highest risk group for infective endocarditis, appropriate endocarditis prophylaxis has to be done even for periodontal probing during dental examination. Medication has to be taken one hour before dental treatment, so it is too late to discover this when the patient is sitting already in the
Clinic chair. Medication will follow the most recent recommendation of the American Heart Association.3

Instrument laying
The standard instruments and materials required for non-surgical periodontal therapy may include the following:

- The non-surgical periodontal cassette of instruments
- A speed reducing hand-piece
- A Profin handpiece with inserts
- An ultrasonic insert
- A hand held patient mirror
- A polishing brush or rubber cup
- Polishing paste of different abrasiveness
- Plaque disclosing agents/solutions
- Cotton rolls, gauze packs
- An oral hygiene demo tray containing standard oral hygiene aids and upper and lower jaw models

Some special procedures may require that additional instruments or items have to be picked up from the clinic dispensary.

Oral hygiene evaluation
Every treatment session should start by evaluating the patient’s oral hygiene. Plaque has to be disclosed with a suitable disclosing gel, see above, which is directly painted on the teeth with large cotton pellets after rinsing off sticky saliva. The presence of plaque-covered tooth surfaces is recorded in special forms, and the percentage immediately calculated. The plaque chart should be filled-in in each session to document the patient’s progress in oral hygiene improvement.

Motivation and instruction in proper oral hygiene
Before recording, clean and plaque-covered tooth surfaces and problematic areas (for example, lingual surfaces of the lower mandible) are shown to the
patient who is holding a hand mirror. Most importantly, the percentage of plaque-covered tooth surfaces is immediately conveyed to the patient who should have been informed about ideal percentages (about or below 30%) which have to be achieved during periodontal therapy.

Methods for improving personal oral hygiene should be explained considering frequencies of tooth brushing and techniques already applied. Of greater importance than teaching the patient new techniques is a methodical order in which areas of the dentition are brushed. The recommended procedures and oral hygiene aids are detailed in respective handouts.

**Systematic debridement**

In cases of plaque-induced gingivitis, calculus is usually found only in lower anterior areas and sometimes at buccal surfaces of maxillary molars. It should be removed with the sickle scaler and/or ultrasonic instruments. Plaque-covered and stained surfaces are polished with rotating nylon brushes or rubber cups, while interdental areas can be cleaned with the Profine hand piece and plastic inserts. Air/powder-abrasive systems (ProphyJet) may be used as well. Restoration overhangs and any obstacles to proper plaque removal as well as areas and surfaces promoting plaque formation should be eliminated or smoothened very early during the treatment. Likewise, hopeless teeth should be extracted.

In cases of mild/moderate and advanced periodontitis, subgingival calculus may be found in various areas of the dentition. Thus, the student has to follow a systematic work pattern. A quadrant by quadrant or, depending on extent and severity, even sextant-wise subgingival instrumentation (scaling and root planing) is recommended (see remarks on single-stage full-mouth disinfection below). While sickle scalers should be used only in supragingival areas, various area-specific and universal curettes are instruments of choice for subgingival debridement. The student is also advised to use, in addition, ultrasonic instruments for subgingival debridement. In general, the Cavitron inserts TFI 10 and TFI 1000 or their equivalents can be used. In deep pockets, however, the Slimline inserts are more convenient. Note that subgingival debridement needs,
in the majority of cases, local anesthesia. After scaling and root planing, supragingival tooth surfaces have to be polished. The session is completed with topical fluoride application.

Following each session of the initial therapy, an accurate report has to be written in the *Treatment Progress* part of the record, including the percentage of plaque-covered surfaces and a note about where subgingival debridement was completed. The next treatment session should then start by

- checking the patient’s oral hygiene
- checking the results of the previous session’s subgingival debridement and, if necessary, completing additional scaling in the area, and
- proceeding with subgingival debridement in the next quadrant or sextant.

**Antimicrobial therapy**

Periodontal diseases have a multifactorial, mainly bacterial, etiology. Current data suggest that a rather small group of Gram-negative, anaerobic or microaerophilic bacteria within the dental biofilm is associated with disease initiation and progression. Organisms strongly implicated as etiologic agents include *Porphyromonas gingivalis, Aggregatibacter (Actinobacillus) actinomycetemcomitans, Tannerella forsythia, Treponema denticola*, and *Eubacterium nodatum*.

Although mechanical periodontal treatment combined with proper oral home care procedures have the potential to arrest disease progression in the vast majority of cases, adjunctive systemic antibiotics may improve the situation in certain cases of recurrent advanced chronic periodontitis, and, in particular, aggressive periodontitis. In addition, periodontitis as manifestation of various systemic diseases usually requires adjunctive antibiotics.

Moreover, topical delivery of antimicrobial agents may be suited for the treatment of localized non-responding or recurrent periodontal disease when repeated mechanical instrumentation has resulted in tooth hypersensitivity and/or loss of root substance. The instructor will advise the student as to what type of antibiotic regime is indicated and if and when a microbiological examination should be
performed. In any case of chronic periodontitis mechanical debridement before the application of antibiotics and good mechanical plaque control after therapy are essential for treatment success.

Another established approach to tooth debridement and lowering oral load with bacteria is the *single-stage full-mouth disinfection* conducted within, say, 24 hours. In addition to scaling under local anesthesia different mouthwash/gel preparations of chlorhexidine (for example 0.12% chlorhexidine as a mouthwash and 1% chlorhexidine gel for tooth brushing) for several weeks are used/prescribed aiming in disinfection of oral mucosal surfaces as well. This approach might be particularly suitable in patients with communication problems who are running the risk for insufficient treatment or even unnecessary extractions because of non-compliance. The rationale of this treatment is allowing the periodontal tissues to heal even in case of insufficient oral hygiene. Largely reduced probing depths afterwards may preclude the re-establishment of gram-negative anaerobes at least for some time. In addition, although this approach might not have an immediate advantage in clinical terms, few side effects and shorter treatment duration might be preferred by certain patients. It should be noted that certain patients cannot comply with the schedule and the massive use of the adjunct antimicrobial chlorhexidine.

**Reevaluation and completion of initial phase therapy**

When the student gets the impression that the treatment effect obtained during initial therapy cannot be improved further – and following advice from the periodontal instructor – a re-evaluation of the periodontal situation has to be performed, including recording of oral hygiene. Based on the results of this re-evaluation, a decision will be made as to whether periodontal surgery is indicated or not, and a surgical treatment plan will be made in case surgery is indicated. The treatment goals for the initial phase therapy are:

- a high level of oral hygiene with plaque present on only 25-30% of tooth surfaces;
• healthy gingiva with bleeding on probing not occurring on more than 10-15% sites;
• no recognizable supra- or subgingival calculus;
• no restoration overhangs or obstacles to interproximal home care procedures;
• no rough surfaces that might promote plaque accumulation.

When these goals are achieved, successful completion of the initial phase therapy will be approved. In patients where these goals cannot be achieved, be it that the patient is unwilling or unable to sufficiently improve oral hygiene, (s)he has to be informed about the possible consequences which may lead to an altered overall treatment plan. In any case, the student is strongly advised to document any efforts made during the initial treatment phase regarding the patient’s motivation and instructing in proper oral hygiene.

The non-surgical periodontal instruments tray
• Mouth mirror (LM 25) with handle
• Dressing pliers (Hu Friedy DP18 or DP17)
• Periodontal probe with 3-2-3-2-mm markings (Hu Friedy CP18)
• Mini sickle scaler (LM 311-312)
• Straight sickle scaler (LM H6-H7)
• Gracey 1/2 (LM 201-202)
• Gracey 7/8 (LM 207-208)
• Gracey 11/12 (LM 211-212)
• Gracey 13/14 (LM 213-214)
• Syntette (LM 215-216)
• Arkansas sharpening stone, plastic stick

The surgical phase of periodontal therapy
Access problems for root debridement are common reasons for persisting periodontal pockets after initial periodontal therapy. A definite decision as to whether, how and where periodontal surgery should be performed has to wait
until the initial therapy has been successfully completed. A high level of oral hygiene is a prerequisite for preceding surgical interventions. Patients that are not able or willing to practice a high level of oral hygiene will usually not benefit from periodontal surgery. The periodontal instructor will make decisions in this respect.

_Pretreatment medication_

Pretreatment medication, for example antibiotic prophylaxis, will follow a standardized setup in the Dental Clinic (see Clinical Policy Manual and respective handouts).

_Surgical attires_

Students will have to use special attires, surgical gloves, face shield and masks during the performing of periodontal surgery in the Dental Clinic. The requirements will be described in a handout and they will be standardized for all surgical procedures performed in the Dental Clinic.

_Instruments and cubicle laying_

The standard instruments and materials required for surgical periodontal procedures may include the following:

- The surgical periodontal cassette of instruments
- Sterile covers for the unit tray and the cubicle bench surface
- Sterile suction tip
- Sterile gauze packs
- Sterile needle/suture and periodontal dressing with mixing pad
- Sterile scalp blades.

Additional instruments may be required for special procedures which are provided by the clinic dispensary. The unit tray and the cubicle bench surfaces must be thoroughly cleaned and disinfected and covered by sterile covers. The lid of the surgical cassette should be used as a sterile tray where instruments can be placed during the operation.
Anesthetics

Surgical and non-surgical periodontal operations need to be done under local anesthesia. In order to reduce bleeding and improve access and visibility during the operation, 2% solutions of Lidocain with adrenalin at a concentration of 10-12 μg/mL (1: 80,000 to 1: 100,000) are usually used in the clinic if not contraindicated.

The following surgical procedures are being taught to undergraduate students in the Dental Clinic:

Access surgery

The main rationale for access surgery (access flap, modified flap operation, modified Widman flap) is to get better access to the colonized root surface in the case of persistent periodontal pockets, say, in excess of 5 mm and bleeding on probing and to visually check effectiveness of mechanical debridement. Mostly, infrabony pockets and degree 2 or 3 furcation involvement will make surgical access necessary. Other objectives may be small alterations of tooth morphology (odontoplasty), gingiva (gingivoplasty), and/or bone (osteoplasty) in order to facilitate better healing and/or home care plaque control measures.

Apically repositioned flap

The apically repositioned flap is indicated in certain situations, for example, for surgical crown lengthening or tunnel preparations of mandibular molars with advanced furcation involvement. Special suturing techniques are required to keep the flap in an apical position.

Gingivectomy

Many patients are nowadays taking certain drugs known for having gingival enlargements as side effect, for example Cyclosporine A, calcium channel blockers, or phenytoin. Gingivectomy, i.e., the removal of gingival tissue for
pocket elimination is the treatment of choice in these cases. Because of serious undesired side effects as esthetic problems and tooth sensitivity, this procedure is nowadays rarely used for the surgical treatment of periodontitis.

*Other surgical techniques*

Some patients may require mucogingival surgery, mainly for surgical root coverage; or root resection or hemisection of furcation-involved teeth; or regenerative procedures such as guided tissue regeneration. A clinical instructor or a specialist will perform these operations in the staff clinic or the surgical operation section. Students are encouraged to assist such operations on their own patients.

*Sutures and periodontal dressings*

Suturing will be required whenever a periodontal flap has been mobilized. Disposable needles with sutures will be used. Among the various suturing materials available, 5-0 synthetic, monofil material, with 3/8 circle, reverse cut needles may be most suitable. Some flap operations as well as gingivectomy procedures require covering of the wound surface by a dressing for protection, patient comfort and control of bleeding. The standard surgical dressing used in the clinic is CoePak (regular set and fast & hard set).

For detailed information on surgical techniques and treatment options the student is referred to the recommended textbooks.

*Postoperative precautions*

Following surgical operations, the patient should always receive information and instructions regarding possibilities of pain, swelling, infection, bleeding, loss of dressing, etc. This information should be given verbally to the patient as well as in writing. Such postoperative information will be standardized in the Dental Clinic and the written information will be used whenever a patient has been treated surgically.
Usually, postoperative prophylactic antibiotics are not justified following periodontal surgery, in particular not in patients with chronic periodontitis. However, the patient’s systemic condition, a diagnosis of aggressive periodontitis, and certain events during the surgical procedure may make it necessary to prescribe postoperative antibiotics. The mentor shall advise the student on a case-by-case basis in such a case. Prescription of analgesics may depend on the specific circumstances, and given contraindications should be strictly considered. In general, patients should be provided with appropriate analgesics for the prevention of postoperative pain. Patients should generally rinse twice daily for 1-2 min with a 0.1-0.2% chlorhexidine-dicluconate mouthwash as long as tooth brushing is not possible in the surgical area. Sutures and dressing will usually be removed after 7 days. In case of gingivectomy, a second dressing should then be placed for another week. Patients should be followed up on a weekly basis until healing is accomplished.

Completion of the surgical phase of therapy
The surgical phase of periodontal therapy is completed when all planned surgical interventions have been performed and complete healing has occurred. The patient should have at this stage:

- A high level of oral hygiene with plaque present on less than 25-30% tooth surfaces
- Healthy gingiva with bleeding on probing of less than 10-15% sites
- No recognizable supra- or subgingival calculus
- No overhangs or obstacles to interproximal home care procedures
- No rough surfaces that might promote plaque accumulation
- No or very few deep periodontal pockets with periodontal probing depths of 5 mm or more bleeding on probing

Completion of the surgical phase of therapy will, for most patients in the Dental Clinic, constitute only part of the planned comprehensive treatment. The periodontal treatment of the patient will be approved and graded as an integral
part of the comprehensive treatment. The final approval will require re-
examination and re-charting about 6 weeks after the periodontal treatment has
been accomplished.

The surgical periodontal instruments tray
- Mouth mirror (LM 25) with handle
- Dressing pliers (Hu Friedy DP18 or DP17)
- Surgical tissue pliers (Hu Friedy TP33 or TPG3)
- Periodontal probe with 3-2-3-2-mm markings (Hu Friedy CP18)
- Needle holder Olsen Hegar (Hu Friedy NH5068)
- Straight scalpel holder (Hu Friedy 10-130-05E)
- Periosteal elevator (Hu Friedy P24GSP or P8D)
- LaGrange gingival scissors (Hu Friedy S14)
- Goldman-Fox universal curette (Hu Friedy SGF4)
- Gracey curettes 1/2, 7/8, 15/16, 17/18 (LM or Hu Friedy)
- Cheek retractor (Hu Friedy SR1)
- Suture material C3 reverse cut, 3/8 circle, 5-0 polyester (Hu Friedy
  PSNR698L, or polypropylene)
- Suture material C6 reverse cut, 3/8 circle, 4-0 polyester (Hu Friedy
  PSNR683L, or polypropylene)
- Cement spatula (Idea Dewimed NDD 243540)
- Arkansas sharpening stone, plastic stick
- Gauze packs

Additional instruments:
- Schluger/Sugarman bone files (Hu Friedy FS9/10S, FS1/2S)
- Universal 360° blade handle (Hu Friedy K360)
- Microsurgical instruments (on demand)
Supportive periodontal therapy

Maintaining a successful result of the periodontal treatment depends on a great extent upon the patient’s willingness and ability to keep a high level of oral hygiene through his/her homecare efforts. Apart from this, a certain number of established risk factors which are associated with the initiation, development and progression of periodontitis have to be considered. Among them, genetic factors, systemic disease as diabetes mellitus; and in particular tobacco smoking operate at the subject level, while certain other factors may operate at the dentition or the individual site level. Therefore, supportive periodontal therapy has to be planned on an individual basis for each patient. Supportive periodontal therapy has to be established after re-evaluation of the periodontal situation about 6-8 weeks after wound healing has been accomplished. A thorough risk assessment has to be done considering:

- **Patient level risks**, such as genetics, systemic disease, and behavioral risk factors such as smoking
- **Dentition level risks**, such as already lost teeth due to periodontal disease, the alveolar bone level as related to age, fixed or removable dentures, amount of bleeding after probing, persistent infection with, for example, *Aggregatibacter actinomycetemcomitans* or *Porphyromonas gingivalis*
- **Tooth and site level risks**, such as increased probing depths, open furcations, frequent bleeding after probing, local presence of pathogens.

Specific functional risk diagrams are most suitable for both patient motivation and risk assessment and should be done online at [http://www.perio-tools.com/pra/en/](http://www.perio-tools.com/pra/en/).

The 1-hour recall session consists of:

- Detailed history in particular with regards to established risk factors for periodontitis and possibilities for controlling them
- Thorough periodontal examination including assessment of oral hygiene
- Re-motivation and re-instruction if necessary
• Supragingival scaling and polishing; subgingival scaling under local anesthesia in areas with persistent pockets (5 mm or more) which have bled upon probing
• Topical application of suitable fluoride solution/gel.

The suggested recall interval will mainly depend on the overall risk, meaning that patients with a low risk for periodontal destruction will be followed-up after 1 year, while patients with moderate and high risks will be seen after 4-6, or even 3 months, respectively.

In a few cases, patients may continue to present with periodontal problems in spite of practicing good oral hygiene and without any obvious local causes. In such cases, bacteriological sampling from involved sites, identification of possible pathogens and antibiotic therapy may be indicated. The mentor will advise the student in these cases. A handout will be prepared describing the bacteriological sampling procedures.

A stringent time schedule for patients within the comprehensive treatment plan has to be followed (see Table below) which has to be approved by the clinical instructor or, in complicated cases, after consultation with the respective specialist.
**Table.** Aims and proper timing of periodontal measures within the comprehensive treatment plan

<table>
<thead>
<tr>
<th>Phase</th>
<th>Aims</th>
<th>Measures</th>
<th>Session</th>
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<tr>
<td><strong>Phase I</strong></td>
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<tr>
<td></td>
<td><strong>Aims</strong></td>
<td><strong>Measures</strong></td>
<td><strong>Session</strong></td>
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<tr>
<td></td>
<td>• To prevent/control dental caries and gingivitis</td>
<td>Detailed History, Clinical Examination</td>
<td>1&lt;sup&gt;st&lt;/sup&gt; session</td>
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<td></td>
<td>• To arrest progression of periodontitis</td>
<td>Preventive measures</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt; session</td>
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<td></td>
<td></td>
<td>• Oral hygiene assessment</td>
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<td>• If needed, extraction of hopeless teeth</td>
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<td>• If needed, provisional restorations for open carious lesions; removal of overhangs interfering with oral hygiene</td>
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<td>• Instructions for improving oral hygiene</td>
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<td>• Scaling/root planing</td>
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<td></td>
<td></td>
<td>• Oral hygiene assessment</td>
<td>3&lt;sup&gt;rd&lt;/sup&gt; up to (if needed) 5&lt;sup&gt;th&lt;/sup&gt; session</td>
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<tr>
<td></td>
<td></td>
<td>• Scaling/root planning, polishing</td>
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<td>• Small definitive restorations</td>
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<td></td>
<td><strong>Periodontal reevaluation</strong></td>
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<td>• After 2 weeks (in case of gingivitis/mild periodontitis)</td>
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<td></td>
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<td>• After 4-6 weeks (in case of moderate/advanced periodontitis)</td>
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<td><strong>Phase IIa</strong></td>
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<td><strong>Aims</strong></td>
<td><strong>Measures</strong></td>
<td><strong>Session</strong></td>
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<td></td>
<td>• To gain surgical access for scaling and root planning in infrabony and furcation lesions</td>
<td>If needed periodontal surgery, oral surgery including inserting implants</td>
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<td>• To regenerate lost periodontal tissues</td>
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<td></td>
<td><strong>Periodontal reevaluation</strong></td>
<td>After 6-8 weeks</td>
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<td><strong>Phase IIb</strong></td>
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<td><strong>Aims</strong></td>
<td><strong>Measures</strong></td>
<td><strong>Session</strong></td>
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<tr>
<td></td>
<td>• Restoration of function and esthetics</td>
<td>If needed, fixed and removable dental prostheses</td>
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<td>If needed orthodontic treatment etc.</td>
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<td><strong>Phase III</strong></td>
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<td><strong>Aims</strong></td>
<td><strong>Measures</strong></td>
<td><strong>Session</strong></td>
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<td></td>
<td>• To prevent recurrence of dental caries and periodontal disease</td>
<td>Supportive care</td>
<td>Depending on dental caries and periodontal risk assessment</td>
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<td></td>
<td>• To interfere with risk factors</td>
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TEACHING PERIODONTOLOGY WITHIN COMPREHENSIVE DENTAL CARE (CDC)

Teaching in Periodontology has to be fully integrated in any CDC. Periodontal diseases are widespread and important enough to be addressed within the framework of the treatment plan. Prognosis of teeth with periodontitis is compromised. On the other hand, teeth with a largely reduced attachment apparatus can be integrated into complex treatment plans including fixed and removable dental prostheses as well as implants provided they have received proper treatment. Therefore, teaching in Periodontology is preferably done in a longitudinal manner.

PATIENT CATEGORIES AND STUDENTS’ PROFICIENCIES

Gingivitis/mild periodontitis – Semesters 6, 7

Any teaching within a discipline has to consider epidemiological data of the disease. The majority of patients seeking help in dental practices or clinics do not have periodontitis, but cavities, defective restorations, endodontic problems, etc. Prevalence of plaque-induced gingivitis may reach, on the other hand, almost 100%, simply due to the omnipresence of plaque. An important aspect of any dental intervention is therefore oral prophylaxis with benefits also for other disciplines in dentistry. Oral prophylaxis is the basis for any further dental treatment and a first exercise for junior students in the second half of the first clinical year. The treatment should result in improved oral hygiene and a reduced number of sites bleeding upon probing. There is no evidence that excellent or optimal plaque and bleeding scores (for example 25 and 10%, respectively) are necessary to avoid development and progression of destructive periodontal disease. A satisfactory level of personal oral hygiene therefore depends very much on the ability and willingness of the patient to permanently maintain a high standard in this regard. Oral hygiene should be reinforced during further
treatments (restorative, orthodontic, etc.) on a regular basis. Supervision of oral prophylaxis in these patients can be accomplished by any dentist or even dental hygienist. Specialists should not be involved in these cases.

**Mild/moderate periodontitis – Semester 8**
Mild/moderate chronic periodontitis does affect 35-40% of any population, see recent data collected in the United States [here](#). These patients may be treated with supra- and subgingival scaling in addition to oral hygiene. Treatment of these cases should be accomplished by more advanced students with experience of, say, 3 finished cases with gingivitis. Even then, treatment has closely to be supervised by a specialist. In case oral hygiene can be improved substantially, these measures are usually sufficient for a desired stabilization of the periodontal situation within a carefully planned maintenance program which considers risk factors on a general, dentition, and tooth level (see below). It has to be kept in mind, however, that a considerably high proportion of patients with mild/moderate periodontitis cannot, or is not willing to, permanently improve their oral hygiene. This is mainly due to the lack of serious complaints at that stage of the disease, particularly when compared to the necessary considerable effort for a sufficient oral hygiene improvement. Stabilization of the periodontal situation can, therefore, not be expected in the long run. It is an important part of any interdisciplinary collaboration that the periodontist must, in that case, inform for example the prosthodontist about an impaired prognosis of certain teeth which might result in an alternative (much simplified) overall treatment plan. Definitive treatment plans in the very beginning of therapy have, therefore, to be avoided. However, any attempts of students to improve their patients’ oral hygiene have to be rewarded even in failing cases provided plaque indices and content of training sessions are fully documented.

**Advanced periodontitis – Semester 9**
Advanced chronic periodontitis does affect [about 10% of the population](#). In particular older patients with more complicated conditions are affected. Senior
students should accomplish the non-surgical and surgical phase of at least 1 patient with advanced periodontitis during the curriculum. Treatment should be done in close cooperation with the specialist. Frequently, access problems as infrabony lesions and advanced furcation involvements may make surgical intervention necessary, and students should get the opportunity for assistance in the respective surgical operations done by a specialist. This is only indicated, however, if oral hygiene is excellent. In general, considerable discomfort or even painful situations/emergencies may lead to better compliance with suggested treatment measures. However, if oral hygiene remains insufficient, affected teeth might be rather extracted and the patient provided with, e.g., a simple removable dental prosthesis. Again, since new situations and aspects may emerge during the treatment, definitive treatment plans should be avoided in the beginning.

Aggressive forms of the disease with advanced bone loss at young age may affect less than but 5%. They should not be referred to the University student clinic. Treatment should be done by specialized staff, but students should be involved by, e.g., assisting certain non-surgical and surgical sessions. The same holds for necrotizing periodontal disease and other emergencies.

**Supportive periodontal therapy - Semester 10**

An important aspect of any dental treatment is supportive care. Risk assessment and risk management are cornerstones of this treatment phase. Students in the final year should recall patients after successful treatment of periodontitis in well-defined intervals which entirely depend on the results of risk assessment. In any practice or clinic, recall patients will soon overwhelm any schedule. Therefore, maintenance therapy has to be confined to successfully treated patients with periodontitis, and high-risk patients.

While students are generally encouraged to complete sometimes complex treatment of several patients with mild, moderate or advanced periodontitis during their clinical studies, full credit for any periodontal treatment is granted if and when a **treatment phase** could be completed and the patient is subsequently
referred to a either a junior student, the supervising dentist or a specialist for further treatment.

Professor Hans-Peter Müller

Tromsø, August 18, 2016